

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named	
Inventor :	Anders Jirskog
Appln. No.:	10/518,889
Filed :	September 6, 2005
For :	CIRCUIT FOR MULTIFREQUENCY BAND RADAR LEVEL GAUGE
Docket No.:	S108.12-0035
	Group Art Unit: 3662
	Examiner: Matthew M. Barker

RESPONSE TO OFFICE ACTION

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

ELECTRONICALLY FILED
JUNE 25, 2008

Sir:

This is in response to the Advisory Action dated May 14, 2008 and the Office Action dated February 26, 2008.

Applicant respectfully submits that all pending claims 1-3, 5, 7-10, and 12-16 are in condition for allowance. Reconsideration and favorable action are respectfully requested.

In the Advisory Action, the Examiner maintains the 103-rejection based on Schultheiss, and states that as Schultheiss does not explicitly limit the range of frequencies, the person skilled in the art would contemplate using frequencies separated by a ratio of 1.5 or even 2.

For several reasons, Applicant submits that this is incorrect, and that a person skilled in the art immediately would realize that Schultheiss in fact teaches a frequency agility type of radar level gage. Thus, as explained in the previous response, even if no numerical frequency values are specifically mentioned, the skilled person would expect the different frequencies used in Schultheiss to be spread out within a relatively narrow frequency range. More specifically, Schultheiss does not (explicitly nor implicitly) teach the use of frequencies in different *frequency bands*, separated by a factor 1.5.

For all kinds of equipment using electromagnetic waves the choice of operating frequencies is far from free but must be chosen from a range of frequencies within one or several disjunctive frequency bands assigned for applicable use. The term “frequency band” is a standard term used in radar and radio technology. The term has a meaning of convention or formal rules in contrast to a more general term like “frequency range” or “interval of operating frequencies”. Among all persons of ordinary skill in the art and in more or less all radar textbooks (like the 3 issues of the standard book of Merrill Skolnik mentioned in the application or in for example David Bartons “Radar Encyclopedia” from Artech House 1997) the notions C-band, X-band, K-band, V-band and W-band are used for the frequency bands 4-8 GHz, 8-12.5 GHz and 18-26.5 GHz, 40-75 GHz and 75-110 GHz, respectively. Another example of the use of the term “frequency band” is the European norm (issued as draft 2005) ETSI 302372-1 where the frequency bands allowed for radar level gauges are listed as: 4.5-7 GHz, 8.5-11.5 GHz, 24.05-27 GHz, 57-64 GHz and 75-85 GHz. Each level gauging band is formed by a portion of one of the conventional radar bands C, X, K, V and W. Yet another example of the term frequency bands is the “restricted frequency bands” assigned by FCC in §15.205 in CFR47 to recognize bands where no intentional radiation regardless to power level is allowed. Among the 64 radio frequency bands listed in §15.205 are 7.25-7.75 GHz, 8.025-8.5 GHz, and 17.7-21.4 GHz stressing the fact (well known among anyone with ordinary skill in the art) that the usable frequency bands are really *disjunctive* bands. Throughout the present patent application the concept “frequency band” is used to stress the difference between using several frequencies (or a frequency range) within one frequency band and using two (or more) frequency ranges (or several discrete frequencies) located in two different frequency bands.

It is again emphasized that Schultheiss nowhere in his patent application indicates use of different frequency bands. In light of the generally accepted definition of the term “frequency bands”, it is therefore highly unlikely that a person skilled in the art would contemplate anything other than use of different frequencies *within one frequency band*.

The specification of Schultheiss also gives some guidance regarding the frequency range.

As can be seen in figures 2a and 2b, the reflections obtained with two different frequencies are mainly different in terms of resolution. The main characteristics (i.e. number of peaks, location of peaks, amplitude, etc) are essentially similar. This indicates that the frequencies are not very different, and most definitely lie within the same frequency band.

Further, if frequencies of different frequency bands are to be used, suitable logic has to be used in the level gauge system to make a good evaluation or averaging of the measured data. On the contrary, in a frequency agility case standard components may be used. As Schultheiss does not indicate anything other than use of standard level gauging circuitry, a person skilled in the art would have to assume that the different frequency lie within one frequency band.

Due to the very wide separation between the frequency bands used in the present invention, the present invention provides an adequate measurement performance at essentially any type of environmental conditions. To illustrate the range of differences, the lobe-width for the same antenna diameter is around 4 times bigger at e.g. 6 GHz compared to 25 GHz, while the attenuation through the same layer of dirt or foam corresponds to 4 times longer measuring distance at 6 GHz as compared to 25 GHz, given the same sensitivity. With the same measure the possible range at 6 GHz is around two times the range at 10 GHz given the same layer of dirt and the same antenna size.

Thus, the widely separated frequency bands of the present invention may utilize the differences in attenuation due to foam on the surface, wet dirt, etc, and the differences in beam-width, to provide correct and reliable measurements regardless of the specific conditions at hand. Such troublesome environmental conditions situations could not be handled adequately in the prior art solutions, related to frequency agility type of radar level gauging.

To conclude, the present invention as defined in the pending claim set differs from the prior art at least in the use of frequencies within different frequency bands, and by the wide separation of these frequency bands. Such a solution is neither suggested, nor indicated, from the cited prior art. On the contrary, the cited reference (Schultheiss) is concerned with a totally different technique, viz. so-called frequency agility. At the date of the present invention, the

inventive solution would not have been obvious for the skilled addressee, facing the above-discussed problems.

In view of the above remarks, reconsideration and favorable action is respectfully requested.

The Director is authorized to charge any fee deficiency required by this paper or credit any overpayment to Deposit Account No. 23-1123.

Respectfully submitted,

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